



GENERAL POST OFFICE

Report
of the
Television Advisory
Committee
1960



LONDON
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1960
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FOREWORD

The Television Advisory Committee was set up to advise the Postmaster General. It has the following general terms of reference:

"To advise the Postmaster General on the development of television and sound broadcasting at frequencies above 30 megacycles per second and related matters, including competitive television services and television for public showing in cinemas and elsewhere."

In publishing this Report the Postmaster General emphasises (a) that the Government has reached no conclusions on it, and (b) that if any changes in line standards were to be decided upon, they would, as paragraph 48 of the Report indicates, "require to be made in accordance with a long-term phased programme which should take account of the interests of the viewers, the Broadcasting Organisations, and the Radio Industry. The 405-line services would need to be continued for many years," and therefore no one need be deterred from buying television sets of the existing types.

May, 1960.

Questions put to the Committee

1. We were asked by your predecessor in March, 1956, for advice on fundamental technical problems of television development.

2. In particular we were asked whether we would:

- (a) recommend whether the existing 405-line standards were likely to remain adequate for all purposes for the next 25 years;
- (b) say whether there was any reason why the United Kingdom should not adopt 625 lines for Bands IV and V in this country, if it were recommended by the International Radio Consultative Committee (C.C.I.R.) (a standing Committee of the International Telecommunication Union concerned with radio questions) as the European standard;
- (c) make recommendations regarding the general principles of a compatible colour television system for operation, initially at least, only in Bands IV and V;
- (d) recommend the best technical means of transmitting the colour signals associated with (c) above, bearing in mind that these need not necessarily be in the same frequency band as the monochrome signals; and
- (e) take note of, and report on, any proposals by the B.B.C. or I.T.A. for adding colour to transmissions within Bands I and III.

We were, at a later stage, asked to include in our report our views as to:

- (f) the technical advantages to be gained from the use of higher standards in Bands I and III, if the possibility of extension of television into Bands IV and V were to be disregarded, and taking into account the improvement in receiver and other apparatus that may be expected in the next 25 years.

Studies by our Technical Sub-Committee

3. For a proper appreciation of the problems before us it was necessary for our Technical Sub-Committee to put in hand a considerable programme of technical studies involving a number of organisations, including the B.B.C., I.T.A., members of the Radio Industry, the Department of Scientific and Industrial Research, and the Post Office. These studies included:

- (a) Propagation tests in Bands IV and V;
- (b) A large-scale field trial to assess the potentialities of Bands IV and V for television broadcasting and to make a comparison of 405-line and 625-line monochrome transmission in these bands. This field trial involved the subjective assessments of picture quality both in the home and in mobile laboratories. The erection of a high-power Band V transmitter was necessary. This was undertaken by the B.B.C. at Crystal Palace and became available in November 1957;
- (c) Tests on a colour system of the type used in the U.S.A. (the National Television Systems Committee system) but adapted to 405-line standards, to determine its degree of compatibility and whether it was capable of giving acceptable colour reception in the home. These tests were made using colour transmissions from the B.B.C. Crystal Palace transmitter on Channel 1.

We gratefully acknowledge the unremitting effort by all concerned with these studies.

4. We have also had discussion and correspondence with the Radio Industry Council on the questions under examination.

Introductory Remarks

5. In any consideration of the question whether or not new standards should be introduced, there are political and economic factors which will need to be taken into account, for example:

- (a) the number, nature and coverage of the television programmes to be provided;
- (b) the method and time-table by which the new standards should be introduced;
- (c) the costs of introducing the new standards and the way in which they could be met.

6. These questions are mostly outside our terms of reference but, because of the way in which the technical and non-technical problems are interrelated, we have had to consider different possibilities as we went along. We recognise too that, for their final solution, these questions depend on Government long-term policy for television development. But we realise that to formulate such policy demands knowledge of the number of programmes that can technically be made available, consistent with such new standards as may be recommended. In our report we have tried to give this information.

Interim Recommendations

7. We should perhaps recall that in May 1957 we recommended that there should be no decision then on a colour television system for the United Kingdom, as we were convinced that the technical and economic problems of a wholly acceptable and reliable colour system, embracing both transmission and reception, had not yet been solved. Also in March 1959, while we reserved our position on the adoption of a 625-line standard in the United Kingdom, we recommended that the United Kingdom delegation to the IXth Plenary Assembly of the International Radio Consultative Committee (April 1959) should be empowered to say that:

"in the interests of frequency planning the United Kingdom would adopt an 8 Mc/s channel in Bands IV and V, if Europe generally adopts this, and further that if the United Kingdom should decide to adopt 625-line standards in those Bands a 6 Mc/s video bandwidth would be used."

Appendix 1 reproduces the full text. We understand that the delegation was instructed accordingly. Some modification of this advice, not affecting our final conclusions, will be found in paragraph 17.

Bands Available for Television and their Potentialities

8. The B.B.C.'s television service uses the five channels in Band I (41-68 Mc/s). It is now available to over 98 per cent. of the population. No further high-power stations can be accommodated in this Band, but low-power stations will be provided to increase this coverage to over 99 per cent. It is not, however, possible to give a service to Wales separate from that to the West of England.

9. Broadly speaking the I.T.A. use four of the eight channels in Band III (174–216 Mc/s) and their service is at present available to some 94 per cent. of the population. Some use of two of the remaining four channels will be needed to complete their coverage.

10. Both the B.B.C. and I.T.A. programmes are on 405-line standards using 5 Mc/s channels and a 3 Mc/s video bandwidth.

11. Fully exploited on the present 405-line standards the eight Band III channels could provide two television programmes, one with about 98 per cent. (the I.T.A. service) and the other with at least 95 per cent. population coverage. Channel allocations in Band III are being made on this basis. Some of the channels have yet to be cleared of other services. Together, therefore, the two Bands, I and III, could provide three 405-line programmes, two with at least 98 per cent. and one with at least 95 per cent. coverage; alternatively it would be possible to use the remaining channels in Band III to strengthen existing services.

12. Bands I and III are Very High Frequency (VHF) Bands. As regards Bands IV (470–582 Mc/s*) and V (606–960 Mc/s*)—which are Ultra High Frequency (UHF) Bands—we had already been informed by your predecessor that it had been found necessary to appropriate nearly half of the latter for tropospheric scatter links. For television, therefore, Band V is at present restricted to an upper limit of 800 Mc/s. (It is noted, however, that the recent Radio Conference at Geneva decided that below 860 Mc/s broadcasting would have priority over tropospheric scatter links in Europe and it is understood that the United Kingdom policy for tropospheric scatter links is being reviewed in consequence.) If any very large development of television is intended by the Government, the restoration of the higher part of Band V for television purposes would be necessary. In any case, further appropriations of frequency space in television bands for other uses should be avoided.

The use of Bands IV and V

13. The problem of achieving useful coverage from a station will be greater in Bands IV and V than in Bands I and III because of the limitations of radio propagation at the higher frequencies due to the pronounced shadow effects experienced as the frequency rises.

14. Information on the propagation characteristics of the higher bands has been provided by large-scale field trials of the Band V transmitter set up by the B.B.C. at Crystal Palace. The tests have shown that an acceptable television service could be provided in Bands IV and V. Nevertheless, the service area of a transmitter operating in these bands would be more restricted than for the lower bands and more irregular, particularly in mountainous or hilly terrain. It is evident that to give a nation-wide service a greater number of transmitters would be needed in Bands IV and V than in Bands I and III. Whereas some 20 stations are required in each of the lower bands to provide upwards of 98 per cent. population coverage, possibly four or five times as many stations would be needed in Bands IV and V to give 95 per cent. coverage. It can be expected that developments will overcome some of the present limitations of Bands IV and V but they will remain generally inferior to Bands I and III in providing coverage. Further field experience is necessary before precise coverages and numbers of stations required can be given. As

* These are the future limits of Bands IV and V as agreed at the Radio Conference, Geneva, 1959.

in the case of the early estimates of Band III coverage given in our First Report dated 8th May, 1953, experience may show that the present estimates are conservative. The Band V tests have also shown that the noise factor of receivers in this Band is at present relatively high and that UHF receivers require considerable development before being suitable for general use.

15. Because of the undoubted advantages of the VHF Bands (I and III) over the UHF Bands (IV and V) for television we sought advice whether any extension of Band III was practicable within the foreseeable future. The Radio Industry Council feel strongly that any extension of television up to four national or near-national programmes should, if at all possible, be accommodated within Band I and an extended Band III. We were informed, and we understand that the R.I.C., who made separate representations to you, were likewise informed, that the pressure on VHF frequencies is immense, and that the Government must hold a balance between desirable broadcasting development and the requirements on these frequencies for other services. That being so, at this stage no hope could be held out that additional frequencies could be made available in the VHF bands for television purposes. We were also told that the spectrum adjacent to Band III is extensively used or committed for use in the United Kingdom and elsewhere by other services which cannot be displaced. It was for these reasons that the present position as regards Band III in the United Kingdom was confirmed at the Radio Conference at Geneva in December 1959. If, therefore, Government policy is to develop television in the United Kingdom outside the present confines of Bands I and III, use must be made of Bands IV and V.

Monochrome Standards of Definition

16. The present 405-line standards are in accordance with the recommendations made by the Television Advisory Committee in 1936 and were adopted by the B.B.C. from February 1937. That the choice was a wise one at the time is clear from the excellent picture quality achieved when the full potentialities of the system began to be realised. There is no further room for appreciable improvement. Good as the 405-line picture may be for the size of screens now in general use, we do not think that the 405-line system will be adequate for the next 25 years. (Closed circuit television using 625-line standards is already being used in the United Kingdom.)

17. Consideration has been given to the potentialities of the 625-line standards adopted in 1951 by the remainder of Europe (apart from France, which adopted 819-line standards and Belgium, which has both 625-line and 819-line standards) and subsequently by many other countries (see Appendix 2). Our Technical Sub-Committee reported that, in the Band V field trials, a comparison was made of 405-line and 625-line pictures in Band V. The results showed that the overall assessment of the Band V 625-line pictures was not significantly different from that of the Band V 405-line pictures although in areas of comparatively high field strength the 625-line pictures generally received a slightly higher assessment. There was, however, a significant difference in the visibility of the scanning lines—the 625-line pictures being, on average, noticeably better than the 405-line pictures. This difference was not, however, reflected in the overall assessment of picture quality. The Sub-Committee felt that this was due partly to the nature of the trials and partly to the restriction of the video bandwidth of the 625-line system to 5 Mc/s. They considered, however, with one dissentient, that with further development

of this system using a 6 Mc/s video bandwidth and receivers with improved noise factors 625-line pictures, particularly the larger pictures, would show a definite superiority. Following further international discussion the Sub-Committee considered that there would be technical advantages and no loss in picture quality in restricting the video bandwidth to 5.5 Mc/s and increasing the width of the vestigial side-band from 0.75 Mc/s to 1.25 Mc/s. We accept this technical opinion. Appendix 3 illustrates this use of an 8 Mc/s channel.

18. We have considered the desirability of an even higher line standard. The higher the standard the wider the channel required to exploit the full potentialities of the standard and the smaller the number of possible programmes. We feel that the 625-line standard with a total channel width of 8 Mc/s represents the best compromise and is the only one likely to be acceptable to the rest of Europe as a common standard in Bands IV and V.

International Implications

19. Apart, in the main, from France, the Irish Republic and the United Kingdom, the countries in Western and Eastern Europe have adopted 625-line definition for use in Bands I and III. Details of the standards used by the 625-line countries are given in Appendix 4. It will be seen that the main difference is in video bandwidth for which the Western European standard is 5 Mc/s and the Eastern European standard 6 Mc/s. This also means a correspondingly wider channel for the Eastern European standards, 8 Mc/s as compared with 7 Mc/s.

20. At the IXth Plenary Assembly of the International Radio Consultative Committee (C.C.I.R.), Los Angeles, April 1959, the question of television standards for Bands IV and V was discussed. There was a general desire by European countries to reach agreement on common standards for monochrome and colour television in those bands in Europe. All the major European countries concerned stated that they were prepared to use 8 Mc/s channelling in Bands IV and V in order to achieve a uniform arrangement of channels in those bands. France, while contemplating the use of 625-line standards for colour television, using an 8 Mc/s channel, at present wished to make partial use of Bands IV and V for a second 819-line monochrome programme using a 16 Mc/s channel (comprising two adjacent 8 Mc/s channels).

21. We now understand, however, that many Western European countries, while still intending to use 625-line standards with 8 Mc/s channels in Bands IV and V, are considering whether there would be advantage in using in those Bands the technical parameters they already use for 625-line standards in the 7 Mc/s channels of Bands I and III, notably a 5 Mc/s video bandwidth and an 0.75 Mc/s vestigial sideband.

22. In our opinion, a 5 Mc/s video bandwidth as used in Western Europe is not fully adequate for a 625-line picture. Adoption of a 5.5 Mc/s video bandwidth and a 1.25 Mc/s vestigial sideband (paragraph 17) would not detract from the main advantages to be gained from coming into line with Europe generally in Bands IV and V on the two overriding standards of a common definition (625-lines) and a common channel spacing (8 Mc/s).

Number of Services Possible on Different Line Standards

23. Appendix 5 gives an estimate of the number of near-national programmes which could be provided by the four bands, both for 405- and 625-line operations. It will be seen that Bands I and III could give three 405-line

programmes for 5 Mc/s channels, two with 98 per cent. and one with 95 per cent. population coverage, compared with two 625-line programmes of 95 per cent. coverage for 8 Mc/s channels, which in the event might be increased to 98 per cent. Bands IV and V with 8 Mc/s channelling, which the United Kingdom said at the C.C.I.R. (paragraph 7) it was prepared to accept (without entering into any commitment as regards line standards), would give, either on 625- or 405-line standards, two programmes, each with over 98 per cent. population coverage, or three with about 95 per cent. coverage. With 5 Mc/s channelling Bands IV and V would give three programmes with 98 per cent. population coverage or four of 95 per cent. and one of 70 per cent. These estimates assume that Band V is restricted to 800 Mc/s. (If the upper part of Band V were partially restored to, say, 860 Mc/s, then three programmes on 8 Mc/s channels with perhaps 98 per cent. population coverage would be possible. If the whole of Band V became available then four programmes with 8 Mc/s channels and perhaps 98 per cent. population coverage could be provided. The number of programmes on 5 Mc/s channels would rise proportionately.)

Considerations Affecting a Change

24. On whether we should change to 625-lines our task has not been a simple one in view of the various possibilities in regard to number of programmes which may have to be catered for in the future.

25. If only a third programme is required it could be provided, as indicated in paragraph 11, in the remaining channels of Band III on 405-line standards. But Bands I and III cannot accommodate three programmes on 625-line standards. If, therefore, a change to 625-line standards were decided on, a third programme provided now on 405-lines in Band III would have to move eventually to Bands IV and V. A fourth and fifth programme, on any standards, would likewise have to be accommodated in Bands IV and V.

Line Standards: Television Confined to Bands I and III

26. In a situation in which television had to be confined to Bands I and III, we considered whether the case for a change to higher line standards would remain valid and whether in fact it would be practicable to do so without using Bands IV and V to provide an intermediate stage.

27. Our Technical Sub-Committee advised that the only way to change to 625-line standards in Bands I and III without unduly restricting the national coverages of the two existing programmes would be to use 7 Mc/s instead of 8 Mc/s channels. A 7 Mc/s channel would not, however, make possible the full improvement in picture quality which 625-line standards using an 8 Mc/s channel would give.

28. The possibility of making the changeover area by area, with 405-line and 625-line transmissions in parallel and still using Bands I and III only, was considered. While the initial stage would be feasible, subsequent changes would result in severe interference between stations using overlapping channels and operating on the different standards. The alternative would be a simultaneous changeover throughout the country. For this each broadcasting authority would have to provide a second complete transmitting station and studio network for 625-line standards while maintaining its existing 405-line network. Every viewer would need to be prepared for the change, at the given date, with a 625-line receiver, or a dual standard receiver or one which could

readily be converted from 405-line to 625-line operation. Probably a large number of people would not be so prepared, however long the period of notice given, since no 625-line standard programmes would up to then have been transmitted. In our view, such a changeover, although theoretically possible, would be quite impracticable.

29. In these circumstances, our conclusion is that, if television is to be confined to Bands I and III, then the present 405-line standards will have to be maintained.

Line Standards: Television Extending into Bands IV and V

30. We next consider the situation where more than three programmes have to be catered for in the future. Line standards apart, this clearly means the use of Bands IV and V.

31. As the Radio Industry Council have pointed out, the advent of television services using a combination of VHF (Bands I and III) and UHF (Bands IV and V) would make for certain complexities for the industry, the broadcasting authorities and the public, and would involve considerable additional expenditure. But such effects must inevitably arise from the provision of more than three programmes, though they will be less with 405-line than with 625-line standards.

32. What is clear is that the bringing into use of Bands IV and V would offer the last opportunity the United Kingdom will have of changing its line standards. If 405-line standards were introduced into Bands IV and V clearly we would be committed to those standards indefinitely. If 625-line standards were adopted for the higher bands then eventually they would need to be introduced into Bands I and III in order to achieve a single standard. We consider that such a changeover is capable of achievement given a long-term programme in which the aim and phases are made clear to all concerned and as a consequence have the full co-operation of the broadcasters, the viewers and the radio industry. The Radio Industry Council has stated that, given the need to go into Bands IV and V, it is not opposed to the introduction of a 625-line system and would co-operate in bringing about any such changes that may be required.

Non-Technical Considerations

33. Apart from the technical aspects of the introduction of new standards and of the development of television in Bands IV and V, certain economic factors must be mentioned.

34. Estimates of the capital costs involved in the provision of monochrome television services in Bands IV and V must be tentative at this stage. The cost of transmitting stations providing near-national population coverage for one programme and for three programmes might be some £15 million and £25 million respectively and could be spread over a period of some five to ten years. This compares with a cost of about £6 million for the I.T.A. Band III network. The cost of a connecting link system will depend on the number and siting of the stations and the extent to which transmitters could pick up programmes direct from one another. These costs are dependent to only a small extent on the standards used, *i.e.*, 405-line or 625-line. Studio and other costs to the broadcasting authorities will depend on the form of any new service and, if higher definition standards are adopted in Bands IV and V, the extent to which existing services may be duplicated in the higher bands.

35. Receiving installation costs are of the greatest importance since they already represent an annual public expenditure of over £150 million based on an annual sale of two million sets. If single standards were employed in all the Bands (I, III, IV and V) the ultimate increased annual expenditure by the public to get reception in all these bands is estimated at some £14 million for 405-line standards and about £18 million for 625-line standards; if dual standards were used, as might well prove the case for some years, the figure would be about £30 million. Existing sets could not be adapted for 625-line standards in Bands IV and V.

36. The actual total costs of implementing any changeover and how to meet them will depend on Government policy in respect of long-term television development.

Conclusions on Line Standards

37. The introduction of television in Bands IV and V, assuming it to be Government policy to develop television beyond the capacity of Bands I and III, will provide the last opportunity of improving the standards of definition.

38. At such a stage it would be in the long-term interest of television development in the United Kingdom to change over from 405-line to 625-line standards because:

- (a) the existing 405-line standards will not be adequate for all purposes for the next 25 years;
- (b) 625-line standards making full use of an 8 Mc/s channel will give a definite improvement in picture quality over that provided on 405-line standards now, and the gap will widen as the technique develops;
- (c) the maintenance of 405-line operation here would show the United Kingdom to a disadvantage in Eurovision as standard converters degrade picture quality, particularly for conversion to a higher standard, and this would have its effect in selling United Kingdom programme material to the rest of Europe. The international exchange of programmes is likely to grow both in extent and importance;
- (d) 625-line operation with the use of an 8 Mc/s channel would ease the problem of channel sharing with neighbouring countries.

39. We would emphasise the importance, from all aspects of good engineering and economic provision, of planning the use of Bands IV and V (and when the time comes the re-engineered Bands I and III) from the start as an integrated whole. The problem of overall cost, station siting, mast utilisation and frequency assignment as well as the general interests of the viewer can properly be met only by a planned approach.

Colour Television

System

40. In considering monochrome standards we have also had regard to the probable future introduction of colour. We think that future television development should be on the basis of a fully compatible colour system in which colour transmissions can be received in monochrome on a monochrome receiver and monochrome transmissions on a colour receiver.

41. Full-scale field trials of colour television have been carried out in Band I by the B.B.C. using the N.T.S.C. system adapted to 405-line standards; the results of these trials have been published elsewhere (B.B.C. Engineering

Division Monograph No. 18). The N.T.S.C. system is a fully compatible system and the channel bandwidth required for the colour transmission is the same as that required for the monochrome transmissions.

42. In European countries using 625-line standards consideration has been given to the question of colour television standards and various possible systems have been examined including the N.T.S.C. system adapted to 625-line standards. It is believed that all countries who have carried out experimental work on colour television, with the possible exception of France, are of the opinion that at present a system of N.T.S.C.-type would prove the most satisfactory for a public colour television service.

Interim Conclusions

43. Our conclusion is that the adapted N.T.S.C. system, as a system, is satisfactory and that a system of this type is perhaps the only one that could be considered now for use on the present 405-line standards. However, because of the necessary complexities of the present receiving equipment, we consider that such a system is not ready to be brought into service. It is also our view that at this time a colour receiver could not be produced at a sufficiently low price to command an adequate market.

44. Further, we feel that the question of the definition standards to be adopted in Bands IV and V should be determined before a decision is reached on colour. If 625-line services are to be introduced it is naturally desirable that colour when introduced should use this standard. It would not be helpful to introduce colour on 405-line standards in Bands I and III in the meantime. On the other hand, the problem of the production of technically satisfactory colour receivers may well be solved some years in advance of substantial coverage on a new definition standard in Bands IV and V and a reasonable price for these receivers would then only depend on the potential market. It is noted that continual research is proceeding towards the solution of the present technical problems.

45. Further consideration has to be given to the technical details of the colour television standards to be adopted in Bands IV and V and further development of colour display tubes will be necessary before full advantage of 625-line standards for colour television can be realised. If our conclusions in paragraph 38 on the definition standards for monochrome services in Bands IV and V (and ultimately in Bands I and III) are accepted, a colour system of N.T.S.C.-type, or some variant of it, could be introduced when practicable, but we are of the opinion that present technical and economic limitations make it undesirable to introduce a colour television system in the near future.

46. We will report further on the technical details of colour television standards as soon as we are in a position to do so.

Summary of Conclusions and Recommendations

47. Bearing in mind that our examination has been largely confined to the technical aspects of the questions which have been put to us and that we cannot anticipate the answers to the political and economic questions which will need to be taken into account, our conclusions and recommendations are that:

- (a) the existing 405-line standards will not be adequate for all purposes for the next 25 years (paragraph 16);
- (b) 625-line transmission making full use of a channel 8 Mc/s wide offers worthwhile improvements in quality over the present British 405-line

transmission in a 5 Mc/s channel and has other advantages (paragraphs 18 and 38);

- (c) if television is to be confined to the existing VHF Bands I and III, then a changeover to higher standards within those bands is impracticable even for the existing two programmes. Television would therefore have to adhere to the present 405-line standards (paragraph 29). With these standards the two Bands could accommodate a third programme of near-national coverage; alternatively, the remaining channels in Band III could be used to strengthen existing services. (Paras. 11 and 25.)
- (d) Bands IV and V must, therefore, be brought into use if television policy favours:
 - (i) a change on merits from 405-line to 625-line standards even if no additional programme is to be provided (paragraph 28);
 - (ii) more than three programmes whatever the line standards used (paragraph 25).
- (e) extension of television into Bands IV and V would offer the last opportunity for making a change in line standards; and if television policy requires the use of Bands IV and V we recommend the use of 625-line standards with an 8 Mc/s channel in these Bands and ultimately their introduction into Bands I and III (paragraphs 30-32);
- (f) a fully compatible colour system is required (paragraph 40);
- (g) colour should, however, only be introduced using the line standards to be ultimately adopted for monochrome transmission and therefore any decision with regard to the introduction of colour must follow a decision on line standards (paragraph 44).

48. Finally, we would emphasise again that any proposed changeover to new line standards would require to be made in accordance with a long-term phased programme which should take account of the interests of the viewers, the Broadcasting Organisations, and the Radio Industry. The 405-line services would need to be continued for many years so that there would be no question of 405-line receivers becoming prematurely obsolescent.

49. We have not thought it useful at this stage to comment on possible methods of bringing about a change in standards in the absence of some indication of the number of programmes to be provided as part of the long-term plans for television in this country. Once this is known a detailed examination of method, timetable and costs can be made.

Composition of the Committee and of the Technical Sub-Committee

50. A list of our members is at Appendix 6, and of the members of our Technical Sub-Committee at Appendix 7.

The above Report has been approved by the Television Advisory Committee.

CHARLES DANIEL,
Chairman.

J. L. JUDD,
Secretary.

17th May, 1960

18th March, 1959

My dear Postmaster General,

1. We regret that we are not yet in a position to send you our report on line definition standards and colour although we hope to do so before very long.

2. There is, however, a certain minimum recommendation that we can and should make at once. The Plenary Assembly of the C.C.I.R. meets at Los Angeles in April to discuss common standards for television in Bands IV and V and it will be necessary to give instructions on this matter to the United Kingdom Delegation which would enable them to play a full part in this work. The Delegation's main need is to know what channel spacing and video bandwidth should be assumed for United Kingdom planning purposes in Bands IV and V.

3. We understand that most of the rest of Europe are likely to adopt an 8 Mc/s channel in Bands IV and V, and a line standard of 625 lines. Whilst we reserve at this stage on the adoption of such a line standard for this country pending further study of a number of questions, we think that in the interests of combined United Kingdom and European planning for Bands IV and V we should agree to an 8 Mc/s channel spacing with the generality of European countries.

4. Adoption of 8 Mc/s channelling will of course govern the number of national programmes that will be possible in Bands IV and V, although with the present state of knowledge of these bands which are not yet in general use estimates must of necessity be approximate at this stage. The tentative conclusion is that Bands IV and V with 8 Mc/s channelling could give two programmes of 98 per cent. coverage or two having 95 per cent. coverage and one 90 per cent. coverage.

5. We recommend, therefore, that the delegation to the C.C.I.R. should be empowered to say that in the interests of frequency planning the United Kingdom would adopt an 8 Mc/s channel in Bands IV and V, if Europe generally adopts this, and further that if the United Kingdom should decide to adopt 625-line standards in those Bands a 6 Mc/s video bandwidth would be used.

Yours sincerely,

(Sgd.) CHARLES DANIEL,

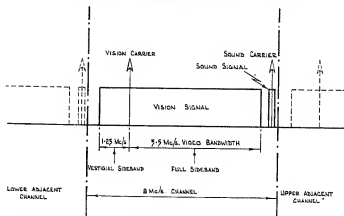
(Chairman of the Television Advisory Committee)

Summary of Television Standards

Line Standards	Adopted in countries shown		Channel Bandwidth in Mc/s
405	United Kingdom		5
525	Bermuda Brazil Canada Colombia Cuba Dominican Republic El Salvador Guatemala Iran Korea	Japan Mexico Nicaragua Panama Peru Philippine Islands Puerto Rico Saudi Arabia Thailand Uruguay U.S.A.	6
625	Argentina† Australia Austria Belgium Bulgaria* Cyprus Czechoslovakia* Denmark Egypt Finland E. Germany W. Germany Hungary* Iraq Italy	Lebanon Netherlands New Zealand Nigeria Norway Poland* Portugal Rumania* Saar Spain Sweden Switzerland Turkey U.S.S.R.* Venezuela† Yugoslavia	7 (Countries shown with an asterisk have adopted the Eastern European 625-line standard employing an 8 Mc/s channel, those shown with a † employ a 6 Mc/s channel)
819	France Algeria Belgium Luxembourg Monaco Morocco		13 (Belgium and Luxembourg have adopted an 819-line system employing a 7 Mc/s channel)

APPENDIX 3

Possible Use of 8 Mc/s. Channels for 625-line Standards in Bands IV & V



The radio-frequency channel assigned to a television station has to accommodate both vision and sound signals and the possible use of 8 Mc/s channels for 625-line television in Bands IV and V as referred to at the end of paragraph 17 is shown in the above sketch.

The "video" signal from the television studio contains frequencies from 0.5-5 Mc/s and at the transmitting station this signal modulates a radio-frequency carrier (the vision carrier). The vision signal comprises the vision carrier, a full sideband extending to 5.5 Mc/s above the vision carrier and a vestigial sideband extending to 1.25 Mc/s below the vision carrier. The "audio" signal from the studio modulates a second radio-frequency carrier (the sound carrier) located 6 Mc/s above the vision carrier to produce the sound signal which comprises the sound carrier and sidebands extending up to about 0.1 Mc/s on each side.

The vision and sound signals are combined and are radiated together from the same transmitting aerial.

The sketch also shows part of the adjacent channels.

APPENDIX 4

Main Details of European 625-line Systems in Bands I and III

Item	625-line system adopted by	
	Western Europe	Eastern Europe
No. of lines per picture	625	625
Video bandwidth Mc/s	5	6
Channel bandwidth Mc/s	7	8
Sound carrier relative to vision carrier ... Mc/s	+5.5	+6.5
Sound carrier relative to edge of channel ... Mc/s	-0.25	-0.25
Line frequency c/s	15625	15625
Field frequency c/s	50	50
Vision modulation	Amplitude	Amplitude
Sense of vision modulation	Negative	Negative
Sound modulation	Frequency	Frequency

Number of Programmes which could be provided in Bands I, III, IV and V for 405- and 625-line Definition

Band		No. of channels for operation on		No. of channels per national programme		No. of programmes which could be provided using		Present Operation
		405 lines 5 Mc/s channels	625 lines 8 Mc/s channels	No.	for estimated % population coverage	405 lines and 5 Mc/s channels	625 lines and 8 Mc/s channels	
I	41-68	5	3	5	98%	2 (98%) 1 (95%)†	2 (95%)† † in event likely to reach 98%	All 5 channels used by B.B.C. (405-lines, 5 Mc/s channels)
III	174-216	8	5					4 channels used by I.T.A. (405-lines, 5 Mc/s channels)
IV	470-582	*22	14	12/13	95%	* { 3 (98%) or 4 (95%) 1 (70%) }	2 (98%) or 2 (95%) 1 (90%)	Not in use
V	606-800	*38	24	17/18	98%			Not in use

Note: Band II is used for VHF FM Sound Broadcasting.

SUMMARY

Bands I and III Could provide 98% coverage of two programmes and 95% coverage of a third using 405-lines and 5 Mc/s channels. With 8 Mc/s channels Bands I and III could give 95% coverage of two programmes, but in event the coverages are likely to reach 98%.

Bands IV and V Could provide 98% coverage of two programmes, or two with 95% and one with 90% using 625-lines and 8 Mc/s channels. Could provide 98% coverage of three programmes using 405-lines and 5 Mc/s channels.

* See, however, paragraph 23 as regards proposed use by the United Kingdom of 8 Mc/s channelling in Bands IV and V.

APPENDIX 6

Composition of Television Advisory Committee

Chairman	..	..	..	Admiral Sir Charles Daniel, K.C.B., C.B.E., D.S.O.
Treasury	..	..	..	Sir Alexander Johnston, K.B.E., C.B. (until 31st August, 1958)
				Sir John Winniffrith, K.C.B. (1st September, 1958–30th March, 1959)
				Mr. B. St. J. Trend, C.B., C.V.O. (from 31st March, 1959)
Ministry of Supply (now Ministry of Aviation)				Mr. J. L. Dunnett, C.B., C.M.G. (January, 1954–17th March, 1957)
				Mr. P. Humphreys-Davies, C.B. (18th March, 1957–30th April, 1959)
				Mr. D. W. G. L. Haviland, C.B. (from 1st May, 1959)
Post Office	..	..	..	Sir Ben Barnett, K.B.E., C.B., M.C. (until July, 1956)
				Mr. W. A. Wolverson, C.B. (from July, 1956)
B.B.C.	..	..	..	Sir Ian Jacob, K.B.E., C.B. (until 1st January, 1960)
				Mr. Hugh Carleton Greene, O.B.E. (from 2nd January, 1960)
I.T.A.	..	..	..	Sir Robert Fraser, O.B.E.
Radio Industry	..	..	..	Mr. G. Darnley Smith, C.B.E.
				Mr. C. O. Stanley, C.B.E.
Independent Members	..	..	..	Sir Edward Herbert, O.B.E.
				The Lord Aberconway
				Sir Walter Puckey
Secretary	..	..	..	Mr. J. T. Beddoe (until 6th March, 1959) (Post Office)
				Mr. J. L. Judd (from 6th March, 1959) (Post Office)

APPENDIX 7

Composition of Technical Sub-Committee

Chairman	Brig. Sir Lionel Harris, K.B.E., T.D., M.Sc., M.I.E.E., General Post Office (until 31st January, 1960)
	Mr. A. H. Mumford, O.B.E., B.Sc., M.I.E.E., General Post Office (from 1st February, 1960)
Deputy Chairman	Sir Harold Bishop, C.B.E., M.I.Mech.E., M.I.E.E., British Broadcasting Corporation
Post Office	Captain C. F. Booth, C.B.E., M.I.E.E.
B.B.C.	Mr. A. B. Howe, O.B.E., M.Sc., A.R.C.S., M.I.E.E.
I.T.A.	Mr. P. A. T. Bevan, C.B.E., B.Sc., M.I.E.E.
	Mr. P. Adorian, M.I.E.E., M.Brit.I.R.E. (until July, 1958)
	Mr. T. C. Macnamara, A.M.I.E.E., Associated Television Ltd. (from August, 1958)
Radio Industry	Mr. G. E. Condliffe, O.B.E., M.I.E.E. (until October, 1956) Electric and Musical Industries Ltd.
	Dr. L. F. Broadway, Ph.D., B.Sc., A.M.I.E.E. (from November, 1956) Electric and Musical Industries Ltd.
	Mr. B. J. Edwards, M.B.E., M.I.E.E., Pye Ltd. (until his decease in February, 1960)
	Mr. K. I. Jones, A.M.I.E.E., Ferguson Radio Corporation Ltd.
	Mr. E. P. Wethey, B.Sc., Kolster-Brandes, Ltd.
	Mr. L. H. Bedford, O.B.E., M.A., English Electric Co. Ltd. (until October, 1956)
	Mr. V. J. Cooper, B.Sc., A.C.G.I., A.M.I.E.E., M.Brit.I.R.E., M.I.R.E., Marconi's Wireless Telegraph Co. Ltd. (from November, 1956)
Others	Dr. R. L. Smith-Rose, C.B.E., D.Sc., Ph.D., M.I.E.E., Department of Scientific and Industrial Research
	Mr. T. M. C. Lance, Rank-Cintel Ltd.
Post Office	Mr. C. W. Sowton, B.Sc., A.C.G.I., A.M.I.E.E. (Secretary)

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